

U.S. Environmental Protection Agency
Region 4, Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Benthic Macroinvertebrate Sorting and Taxonomic Identification**

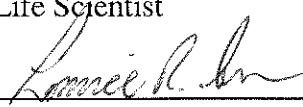
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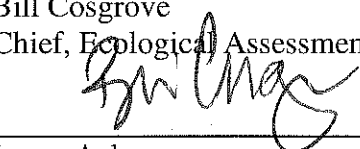
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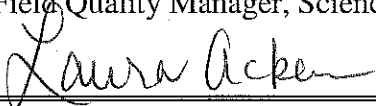
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Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SESD Field Quality Manager.

History	Effective Date
<p>SESDPROC-509-R0, <i>Benthic Macroinvertebrate Sorting and Taxonomic Identification</i>, replaces SESDPROC-509-R0.</p> <p>General Corrected any typographical, grammatical, and/or editorial errors.</p> <p>Title Deleted the hyphen in Macro-invertebrate.</p> <p>Title Page Changed title for Bill Cosgrove from Acting Chief to Chief.</p> <p>Section 1.1 SOP deleted.</p> <p>Section 1.3 Updated information to reflect that procedure is located on the H: drive of the LAN. In addition, text has been revised in this section.</p> <p>Section 1.4 Definition of RBP deleted.</p> <p>Section 1.5 Rename section to References. Referenced procedure number added, corrected title, and revised the citation to be consistent with other citations.</p> <p>Section 1.6 Definition of SESD added. Title of Safety, Health, and Environmental Management Program Procedures and Policy Manual corrected, and citation added.</p> <p>Section 1.6.2, 4th bullet Added references to the CFR and IATA's Dangerous Goods Regulations.</p> <p>Section 2.1 Definition of QC added.</p> <p>Section 2.5 Deleted records not generated by this procedure.</p>	November 1, 2007

Section 3 References added, and list revised to be alphabetical. Other changes made to be consistent. Moved references to Section 1.5.	
SESDPROC-509-R0, Benthic Macro-Invertebrate Sorting and Taxonomic Identification, Original Issue	February 05, 2007

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1 General Information

1.1 Purpose

The purpose of this procedure is to describe the process and methods by which benthic macroinvertebrates are sorted and identified.

1.2 Scope/Application

The methodology, equipment, and sample handling procedures described in this document allow the taxonomist to accurately identify organisms collected from freshwater streams.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the H: drive of the SESD local area network. The Field Quality Manager (FQM) is responsible for ensuring the most recent version of the procedure is placed on the H: drive and for maintaining records of review conducted prior to its issuance.

1.4 Definitions

1.4.1 Quality Control (QC)

Refers to a second biologist performing taxonomic and counts verification

1.5 References

Epler, J.H. 1996. Identification manual for the water beetles of Florida. FL Department of Environmental Protection, Tallahassee, FL.

Hobbs, H.H. Jr. 1981. An illustrated checklist of the American crayfishes (Decapoda: Astacidae, Cambaridae, and Parastacidae). Smithsonian Contributions to Zoology. Number 480. Washington, DC.

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

Larson, D.J. Y. Alarie and R.E. Roughly. 2000. Predacious Diving Beetles(Coleoptera: Dytiscidae) of the Nearctic Region, with emphasis on the fauna of Canada and Alaska. NRC Research Press, Ottawa.

Merritt, R.W., and K.W. Cummins (eds). 1996. An Introduction to the Aquatic Insects of

North America, Third Edition. Kendall/Hunt Publishing Company, Dubuque, IA.

Needham, J.G., M.J. Westfall, Jr. and M.L. May 2000. Dragonflies of North America, Revised Edition, Scientific Publishers, Gainesville, FL.

SESD Operating Procedure for Multi-Habitat Macroinvertebrate Sampling in Wadeable Freshwater Streams, *SESDPROC-508, Most Recent Version*.

Stewart, K.W. and B.P. Stark. 1993. Nymphs of North American Stonefly Genera (Plecoptera). University of North Texas Press, Denton, TX.

Thorp, J.H. and A.P. Covich (eds.) 2001. Ecology and Classification of North American Freshwater Invertebrates, Second edition. Academic Press, San Diego, CA.

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

United States Environmental Protection Agency (USEPA). 1999. Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. EPA 841-B-99-002. Office of Water. Washington, DC.

USEPA. 2007. Safety, Health and Environmental Management Program Procedures and Policy Manual. Science and Ecosystem Support Division, Region 4, Athens, Georgia.

Westfall, M.J., Jr. and M.L. May. 1996. Damselflies of North America. Scientific Publishers. Gainesville, FL.

Wiggins, G.B. 1998. Larvae of the North American Caddisfly Genera (Trichoptera), Second Edition. University of Toronto Press, Toronto, Canada.

1.6 General Precautions

1.6.1 Safety

The samples are preserved with ethanol. Taxonomic sorting and identification of the samples should take place in an adequately ventilated space. Proper safety precautions must be observed when working with ethanol. Refer to the Science and Ecosystem Support Division (SESD) Safety, Health and Environmental Management Program Procedures and Policy Manual (USEPA 2007) and any pertinent site-specific Health and Safety Plans (HASP) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety.

1.6.2 Procedural Precautions

The following precautions should be considered when performing taxonomic sorting and identification:

- Care in handling of organisms in the sorting process is necessary so that specimens are not damaged. This includes storing samples in a secure location to preclude conditions, such as desiccation, which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as bills of lading, will be retained by the project leader and stored in a secure place.

2 Methodology

2.1 Summary of Procedure

This method describes how the samples are sorted and identified, including the taxonomic references used, rules on whether to include or exclude parts of organisms, how the counts are tallied, and how the quality control (QC) checks are performed.

2.2 Equipment and Materials

- Dissecting stereo microscope with 0.7X to 4.5X magnification, additional 10X and 15X magnification eye pieces
- Compound microscope for identification of mounted organisms
- Fiber optic illuminator compatible with dissecting scope
- Digital dissecting stereo and compound microscope with computer
- Automatic counter
- Dissecting forceps
- Dissecting needles
- Eyedropper
- Glass vials with caps
- Squeeze bottles
- 70% ethanol for storage of specimens
- Standard taxonomic laboratory bench sheets
- Benthic Sample Log Book
- Counts and Taxonomic Verification Log Book
- Taxonomic References (see References Section)

2.3 Procedure

Assemble the necessary equipment needed to examine the organism. Assure that the necessary taxonomic references are on hand. Organisms are sorted by major groups to the lowest practical level and labeled with information that aid in further identification. Once an organism is in a position that facilitates viewing, taxonomic identification can proceed. Once the taxonomic determination is made, the number of individuals and the names are recorded on bench sheets. Organisms are identified to the taxonomic level specified in the Quality Assurance Project Plan (QAPP) for the project by a qualified taxonomist using a dissecting microscope.

Note that when organisms are damaged or only pieces of the organism are present, the staff making the identifications must follow strict rules to decide whether and how to identify the organism or part:

- Tails, abdomens and other body parts (except as specified below) should not be counted, even if the identification can be made (e.g. Hydropsychidae).
- Parts of organisms that could not be identified should be discarded with the debris and not added to the sample vial.
- Heads and attached thoraxes are counted when the identification can be made.
- If the identification can not be made at the required taxonomic level (e.g. family) due to the condition or size of the specimen, then the organism should be identified at the next highest level (e.g. order).

2.4 Quality Control

Assure that samples are labeled. Any equipment that has come in contact with the sample must be examined for organisms and then thoroughly rinsed to remove debris. Any organisms found should be placed in the proper vial.

A taxonomist, who was not responsible for the original identifications, should recheck the samples to verify that the original identification was correct. The recheck/verification can be done for specific projects or for randomly selected organisms from samples collected over a period of time, typically one year worth of samples. The frequency of taxonomic verification can be adjusted based on specific data requirements set forth in QAPP. A separate lab data sheet should be prepared with the second identifications and counts. This lab sheet should be clearly identified as a QC check on the top of the lab sheet. Records of these reviews should be documented in the "Taxonomy and Counts Verification Log Book". The reviewer should record the date of the review, the sample ID number, the reviewer, and the taxonomic reference used to make the original identification. Any discrepancies between the original taxa list or counts and the QC taxa list and counts should be recorded in the notebook. Any taxonomic mistakes that are discovered should be discussed with the biologist who performed the original identification immediately. When a taxonomic mistake is made, the original taxonomist and the reviewing biologist should review the taxonomic keys and characters. Any clear mistakes in counts or taxonomy should be corrected on the original lab bench sheet.

A library of basic taxonomic literature is essential in aiding identification of specimens and should be maintained in the taxonomic library. The taxonomic references in common use should be stored on the bench top in the bioassessment laboratory. These references are listed in the References Section in this procedure.

2.5 Records

Records generated will include field notes, recorded in a bound waterproof logbook, field data sheets for physical characterizations, habitat evaluation forms, digital photographs, custody tags, completed chain-of-custody forms, lab bench sheets and if needed, completed receipt for sample forms.